

ZOOLOGY.—North American monogenetic trematodes: VI. The family *Diclidophoridae* (*Diclidophoroidea*).¹ EMMETT W. PRICE, Bureau of Animal Industry.

As in previous sections of the series, this paper deals with flatworms that live as external parasites on cold-blooded vertebrates. The members of the family *Diclidophoridae* are for the most part parasites of marine fishes, living on the gills and occasionally in the mouth. The organization and purpose of this paper are the same as for previous installments (Price, 1937, 1938, 1939a, 1939b, 1942).

DICLIDOPHOROIDEA Price, 1936

Diagnosis.—Anterior haptor in form of two lateral, oval or circular suckers opening into the oral cavity. Posterior haptor variable in shape and position, usually at the posterior end of body, sometimes ventral or lateral, usually provided with two rows of suckers or clamplike adhesive organs having a complicated, heavily cuticularized, riblike, supporting structure; posterior tip of haptor often terminating in a tonguelike structure or “languette” frequently armed with one to three pairs of hooks. Digestive system consisting of a prepharynx serving as an oral cavity, a bulbous pharynx, a short esophagus, and an intestine consisting, except in *Diplozoon*, of two principal branches provided with numerous median and lateral diverticula. Eyes absent. Male and female genital apertures usually opening to exterior through a common pore situated ventrally. Cirrus armed or unarmed. Testes usually numerous, postovarial, occasionally preovarial. Ovary elongate, folded. Vaginae present or absent, usually opening dorsally. Parasites of fishes, or of crustaceans parasitic on fishes.

Type family.—*Diclidophoridae* Fuhrmann, 1928.

KEY TO FAMILIES OF DICLIDOPHOROIDEA²

- 1. Framework of haptoral suckers consisting of 8 principal pieces (Fig. 1, A).....
.....DICLIDOPHORIDAE Fuhrmann

- Framework of haptoral suckers consisting of fewer than 8 principal pieces.....2
- 2. Framework of haptoral suckers consisting of 3 pieces (Fig. 1, F)...HEXOSTOMATIDAE Price
Framework of haptoral suckers consisting of more than 3 pieces.....3
- 3. Haptoral suckers relatively strongly muscular (Fig. 1, B); vagina double (absent in *Octomacrum*), openings lateral.....
.....DISCOCOTYLIDAE Price
Haptoral suckers relatively weakly muscular; vagina when present, usually single and opening dorsally.....4
- 4. Haptoral suckers usually numerous, framework as shown in Fig. 1, C.....
.....MICROCOTYLIDAE Taschenberg
Haptoral suckers variable in number, framework not as above.....5
- 5. Haptoral suckers usually numerous, framework as in Fig. 1, D...GASTROCOTYLIDAE, n. f.
Haptoral suckers few in number, framework as in Fig. 1, E.....MAZOCRAEIDAE Price
Family *Diclidophoridae* Fuhrmann, 1928

Synonym.—*Choricotyliidae* Rees and Llewellyn, 1941.

Diagnosis.—Haptor terminal, usually bearing four pairs of cuplike adhesive structures having a complicated, heavily cuticularized framework of the general type as shown in Fig. 1, A. Cirrus usually armed with a circle of curved hooks, which are crescentic in cross section.³ Seminal receptacle usually, if not always, present. Vaginae usually absent.

Type genus.—*Diclidophora* Diesing, 1850.

KEY TO SUBFAMILIES OF DICLIDOPHORIDAE

- Haptoral sucker clamplike or pincerlike.....
.....DICLIDOPHORINAE Cerfontaine
- Haptoral suckers cuplike.....
.....CYCLOCOTYLINAE, n. subf.

Subfamily *Diclidophorinae* Cerfontaine, 1895

Diagnosis.—Haptor with four pairs of pedunculated clamplike suckers of the type shown in Fig. 1, A. Cirrus armed. Vaginae absent.

Type genus.—*Diclidophora* Diesing, 1850.

the number and shape of the pieces composing the framework of the haptoral suckers; so far no descriptive terms have been proposed for these structures that will impart a sufficiently clear picture of their appearance.

³ The hooks of the genital coronet are crescentic in cross section and this frequently gives them the appearance of being “double pointed.”

¹ Received September 7, 1942.

² No entirely satisfactory key can at present be formulated to distinguish the families of *Diclidophoroidea*. The principal group characters are in

KEY TO GENERA OF DICLIDOPHORINAE

1. Haptor distinctly set off from body proper *Diclidophoroides*, n. gen.
Haptor not distinctly set off from body proper 2
2. Testes postovarial *Octodactylus* Dalyell
Testes preovarial and postovarial
. *Diclidophora* Diesing

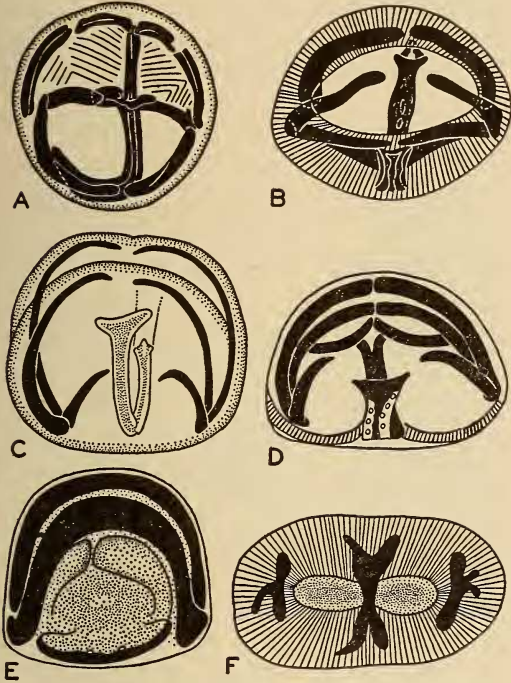


Fig. 1.—Types of haptor suckers in the superfamily Diclidophoroidea: A, Diclidophoridae; B, Discocotylidae; C, Microcotylidae; D, Gastrocotylidae; E, Mazocraeidae; F, Hexostomatidae.

Genus *Diclidophora* Diesing, 1850

Synonyms.—*Dactycotyle* Beneden and Hesse, 1863; *Dactylocotyle* Marschall, 1873.

Diagnosis.—Haptor not set off from body proper, bearing four pairs of pedunculated, clamplike suckers. Testes numerous, preovarial and postovarial. Eggs with polar prolongations.

Type species.—*Diclidophora longicollis* Diesing, 1850 [= *D. merlangi* (Kuhn, in Nordmann, 1832)].

The genus *Diclidophora* was proposed by Diesing (1850) for two species, *D. longicollis* Diesing and *D. palmata* (F. S. Leuckart), the former being *Octostoma merlangi* Kuhn (in Nordmann, 1832) renamed. Both of these species were regarded by Cerfontaine (1895) as

congeneric with *Dactycotyle pollachii* Beneden and Hesse, 1863, the type (subsequent designation by Stiles and Hassall, 1908) of *Dactycotyle* Beneden and Hesse, 1863 (= *Dactylocotyle* Marschall, 1873). Of the two species originally included in the genus *Diclidophora*, *D. palmata* (F. S. Leuckart) is apparently identical with *Octodactylus inhaerens* Dalyell (1853). Since the original species of *Diclidophora*, as well as several species subsequently added to the genus, are clearly divided into two groups on the basis of testicular distribution, it appears desirable to recognize both *Diclidophora* Diesing and *Octodactylus* Dalyell as valid genera. *Diclidophora merlangi* (Kuhn) of MacCallum, 1917, having characters of the subfamily but not being congeneric with either *Diclidophora* or *Octodactylus*, is placed in the new genus *Diclidophoroides*.

The species comprising the genus *Diclidophora* (s. str.)⁴ are *D. merlangi* (Kuhn, in Nordmann, 1832),⁵ from *Gadus merlangus* in Europe; *D. denticulata* (Olsson, 1876), n. comb., from *Pollachius virens*; *D. luscae* (Beneden and Hesse, 1863), n. comb., from *Morrhua lusca*; and *D. pollachii* (Beneden and Hesse, 1863), n. comb., from *Pollachius pollachius*.

⁴ *Dactylocotyle minor* Ishii (1936) renamed *D. thunni* Ishii, in Ishii and Sawada (1938), does not belong to the genus *Dactylocotyle* (= *Diclidophora*) but is a species of *Mazocraea*.

⁵ Dollfus (1922) has raised the question as to the authorship of the name *merlangi*, which was credited to Kuhn by Nordmann (1832), and prefers to regard Nordmann as the author since the name credited to Kuhn was only a manuscript name. In spite of the fact that the name "*Octostoma merlangi* Kuhn" is a manuscript or label name, which probably accompanied specimens that were sent by Kuhn to Rudolphi and later studied by Nordmann, the following are reasons for recognizing Kuhn as the author: Nordmann placed the name "*Octostoma merlangi* Kuhn" as a synonym of "*Octobothrium(?) merlangi*" (= *Diclidophora merlangi*), thereby crediting Kuhn with the name of the species. Opinion 4 of the International Rules of Zoological Nomenclature states that "Manuscript names acquire standing in nomenclature when printed in accordance with the provisions of Art. 25, and the question as to their validity is not influenced by the fact whether such names are accepted or rejected by the author responsible for their publication." The name in question was used for the species now known as *Diclidophora merlangi* and the conditions under which it was used conform to those stipulated under Art. 25; therefore, there seems to be no question as to the validity of the name, and the authorship of the species should, accordingly, be credited to Kuhn, in Nordmann, 1832.

Diclidophora denticulata (Olsson, 1876),
n. comb.
Figs. 2-3

Synonyms.—*Octobothrium denticulatum* Olsson, 1876; *Dactylocotyle denticulatum* (Olsson, 1876) Cerfontaine, 1895; *D. carbonarii* Cerfontaine, 1895.

Description.—Body 7 mm long by 1.6 mm wide at level of ovary, tapering gradually anteriorly. Anterior haptors in form of a pair of suckers, each about 170μ in diameter, opening into oral cavity. Posterior haptor more or less rectangular, about 2.1 mm long, not set off from body proper, bearing four pairs of pedunculated clamplike suckers; no terminal hooks. Suckers about equal in size, 680μ wide, supported by complicated cuticular structure (Fig. 3); wall of suckers muscular; outer anterior quadrant of suckers armed with 30 to 40 lancetlike spines. Oral aperture subterminal; pharynx oval, 187μ long by 153μ wide; remainder of digestive tract not observable in available material. Male genital aperture median, about 595μ from anterior end of body; cirrus about 95μ in diameter, armed with 13 inwardly curved hooks. Testes numerous, small, extending from about one-third of total body length from anterior end to about level of anterior end of haptor. Ovary N-shaped, median, about 400μ in front of anterior limit of haptor. Vitelline follicles abundant, extending from level of female genital pore to posterior end of haptor. Seminal receptacle and vitelline reservoir preovarial. Genito-intestinal canal not observed. Uterus long and slender, in median field. Female genital aperture median, about 190μ posterior to male genital aperture. No fully formed eggs present in available specimen.

Host.—*Pollachius virens* (Linnaeus).

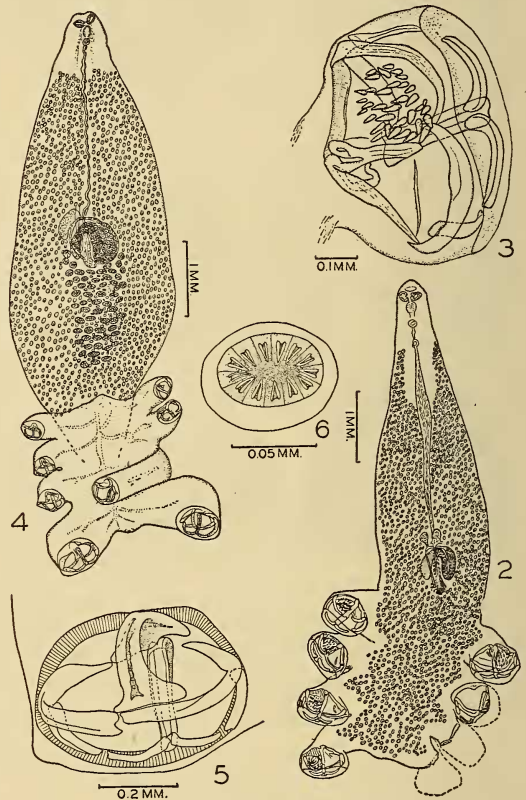
Location.—Gills.

Distribution.—United States (Woods Hole, Mass.) and Canada (St. Mary Bay, Nova Scotia).

Specimen.—U.S.N.M. Helm. Coll. no. 6508.

This species was originally described by Olsson (1876) from specimens collected from *Gadus virens* (= *Pollachius virens*) from the Skaggerak, and, later, Cerfontaine (1895) gave a detailed description of the parasite. In North America there appear to be three records of its occurrence: Linton (1900) reported the finding of one specimen by Prof. H. M. Kelly at

Woods Hole, Mass., and Stafford (1904) and Cooper (1915) reported this species from Canada. The specimen reported by Linton is the one on which the above description is based. This specimen, a toto mount, was in fair condition despite the fact that two of the clamplike suckers of the haptor had been torn off. *D. denticulata* is readily distinguishable from the other members of the genus by the presence of spines on the haptoral suckers.



Figs. 2-3.—*Diclidophora denticulata*: 2, Complete worm, ventral view; 3, clamplike haptoral sucker. Figs. 4-6.—*Diclidophoroides maccallumi*: 4, Complete worm, ventral view; 5, clamplike haptoral sucker; 6, cirrus.

Genus *Octodactylus* Dalyell, 1853

Synonym.—*Pterocotyle* Beneden and Hesse, 1863.

Diagnosis.—Haptor not distinctly set off from body proper. Testes confined to post-ovarial portion of body. Eggs usually without polar prolongations.

Type species.—*Octodactylus inhaerens* Dalyell, 1853 [= *O. palmata* (F. S. Leuckart, 1830), n. comb.].

This genus contains *Octodactylus palmata* (F. S. Leuckart, 1830)⁶ (syns. *O. inhaerens* Dalyell, 1853; *Octobothrium digitatum* Rathke, 1843; *Dactylocotyle molvae* Cerfontaine, 1895), from *Molva molva*; *O. minus* (Olsson, 1876), n. comb., from *Gadus poutasson*; and *O. morrhuae* (Beneden and Hesse, 1863),⁷ n. comb., from *Gadus morrhua*. As none of these species occurs on North American hosts, the genus will not be considered further.

Diclidophoroides, n. gen.

Diagnosis.—Haptor distinctly set off from body proper. Testes postovarial. Otherwise similar to *Octodactylus*.

Type species.—*Diclidophoroides maccallumi*, n. sp.

In addition to the type species, it is possible that *Dactylocotyle phycidis* Parona and Perugia, 1889, from *Phycis blennoides* in Europe may belong here. The description of *D. phycidis*, however, is too inadequate for definite generic allocation. *Heterobothrium ecuadori* Meserve (1938) from *Cheilichthys annulatus* and *H. galapagensis* Meserve (1938) from *Paranthias furcifer*, both from the Galapagos Islands, are tentatively included in *Diclidophoroides*, the new combinations being *D. ecuadori* (Meserve) and *D. galapagensis* (Meserve), respectively. The pincerlike or clamplike nature of the haptor suckers definitely eliminates these two species from the genus *Heterobothrium*. Only the type specimens of Meserve's species were available for examination, but these show the haptors to be fairly well set off from the body proper, although not so distinctly so as in *D. maccallumi*; the haptor suckers are subsessile and equal in size.

Diclidophoroides maccallumi, n. sp.

Figs. 4-6

Synonyms.—*Diclidophora merlangi* MacCallum, 1917; *Dactylocotyle minor* (Olsson, 1876) of Manter, 1926; *D. phycidis* Parona and Pe-

⁶ MacCallum (1917) reported finding on the gills of *Lota maculosa* "a rather delapidated specimen of what seems to answer to the description of *D. palmata*." This specimen has been examined and found not to be a trematode, consequently the report of this species from North America is erroneous.

⁷ The form reported by Scott (1901) from *Gadus callarius* (= *G. morrhua*) under the name of *Pterocotyle morrhuae* is probably not this species.

rugia, 1889, of Stafford, 1904; *Choricotyle merlangi* (MacCallum, 1917) Llewellyn, 1941.

Description.—Body elliptical, 4.2 to 6.9 mm long by 1.5 to 2.1 mm wide. Anterior haptor in form of a pair of suckers, each 76 to 115 μ wide, opening into oral cavity. Posterior haptor somewhat rectangular, 1.8 mm long by 2.3 mm wide in largest specimen, distinctly set off from body proper, bearing four pairs of pedunculated clamplike suckers, peduncles and suckers of different sizes, first pair smallest and posterior pair largest, with complicated cuticular supporting structure (Fig. 5); smallest suckers 170 to 255 μ wide, largest 425 to 510 μ wide. Posterior tip of haptor armed with 2 pairs of minute hooks. Oral aperture subterminal; pharynx oval, 157 to 170 μ long by 70 to 114 μ wide; remainder of digestive tract not traceable except in haptor, here branches observed to enter peduncles of suckers. Genital aperture median, 247 to 340 μ from anterior end of body. Cirrus muscular, 38 to 95 μ in diameter, armed with a circle of 13 to 16 inwardly curved hooks. Testes relatively numerous, small, in median field posterior to ovary; a few testes sometimes lateral to ovary. Ovary elongate, N-shaped, median, equatorial. Vitelline follicles abundant, extending from a short distance back of genital aperture to posterior end of body proper. Seminal receptacle anterior to, and to right of, ovary; vagina and genito-intestinal canal not observed. Uterus slender, in median field. No eggs present in available specimens (eggs non-filamented, according to Manter, 1926).

Host.—*Urophycis chuss* (Walbaum).

Location.—Gills.

Distribution.—United States (Woods Hole, Mass., and Mount Desert Island, Maine) and Canada.

Specimens.—U.S.N.M. Helm. Coll. nos. 35106 (type and paratypes), 35585, and 35586.

Diclidophoroides maccallumi appears to be the same species as that described by Manter (1926) as *Dactylocotyle minor* (Olsson) from *Urophycis chuss*, and as that reported by Stafford (1904) under the name *D. phycidis* Parona and Perugia from the same host in Canada. That *Diclidophoroides maccallumi* is distinct from the form described by Olsson (1868) as *Octobothrium palmatum* Leuck. f. *minor* seems clear, since the haptor in Olsson's form shows the pedunculated suckers to be

equal in size and not unequal as is the case in the specimens described by Manter, or in the specimens collected by MacCallum.

MacCallum thought that this species might be identical with *Dactylocotyle merlangi* (Kuhn), but Dollfus (1922) has pointed out that the two species are not identical and that the name *merlangi* MacCallum should be retained for the species described by MacCallum (1917), since *merlangi* (Kuhn, of authors) belongs in the genus *Dactylocotyle* (= *Diclidophora*). Unfortunately Dollfus's proposal, which is concurred in by Llewellyn (1941), is untenable, as *merlangi* (Kuhn) was placed in the genus *Diclidophora* by Krøyer (1838-40, p. 606) and also by MacCallum (1917); consequently *Diclidophora merlangi* MacCallum is a homonym and must be renamed.

Diclidophora spp.

Linton (1905) reported *Dactylocotyle* sp. from the gills of *Brevoortia tyrannus* and *Diclidophora* sp. from the gills of *Orthopristis chrysopterus*. The first of these forms was illustrated but not described and the second was described briefly as follows: "This specimen is very fragile, the posterior finger-like processes appearing to be somewhat macerated. Dimensions, in millimeters; length 1.68, length exclusive of posterior sucker 1.28; diameter at anterior end 0.08; maximum diameter of body 0.52, of sucker region 0.96; diameter of one of the 8 small suckers 0.13."

The illustration of the form from *Brevoortia tyrannus* indicates that it is probably a new species and may not belong to the genus *Diclidophora*, but the details were not clearly brought out and as no description was given, it seems inadvisable to name it. The description of the form from *Orthopristis chrysopterus* is too inadequate to warrant further consideration.

Cyclocotylinae, n. subf.

Synonym.—*Diclidophorinae* Cerfontaine, 1895 in part.

Diagnosis.—Haptor with four pairs of sessile, subsessile, or pedunculated cuplike suckers, each provided with a heavily cuticularized framework of the type shown in Fig. 1,A. Cirrus armed (except in *Cyclocotyloides*) with hooks as in *Diclidophorinae*. Vaginae usually absent.

Type genus.—*Cyclocotyla* Otto, 1823.

KEY TO GENERA OF CYCLOCOTYLINAE

1. Cirrus hooks absent . . . *Cyclocotyloides*, n. gen.
Cirrus hooks present 2
2. Vaginae present *Diclidophoropsis* Gallien
Vaginae absent 3
3. Framework of anterior pair of haptoral suckers orientated inversely as compared with those of posterior 3 pairs
. *Heterobothrium* Cerfontaine
Framework of all 4 pairs of haptoral suckers occupying same relative orientation 4
4. Testes both pre- and postovarial
. *Cyclobothrium* Cerfontaine
Testes entirely postovarial 5
5. Posterior pair of suckers sessile and widely removed from anterior 3 pairs of pedunculated suckers *Pedocotyle* MacCallum
Posterior pair of suckers either subsessile or pedunculated and not separated from other pairs 6
6. Vitellaria extending into haptor
. *Cyclocotyla* Otto
Vitellaria not extending into haptor
. *Neoheterobothrium*, n. gen.

Genus *Cyclocotyla* Otto, 1823

Synonyms.—*Octostoma* Otto, 1823, not Kuhn, 1829; *Cyclostoma* Otto, 1823, not Lamarck, 1799; *Cyclobothrium* Cerfontaine, 1895, in part; *Choricotyle* Beneden and Hesse, 1863; *Diclidophora* Diesing, of Goto, 1894, in part; *Mesocotyle* Parona and Perugia, 1889.

Diagnosis.—Haptor distinctly set off from body proper; suckers either subsessile or pedunculated, more or less equally spaced. Genital atrium non-muscular; cirrus armed; testes postovarial. Vaginae absent; vitellaria extending into haptor.

Type species.—*Cyclocotyla bellones* Otto, 1823.

This genus was proposed by Otto (1823) for a parasite collected from the "Rucken-Haut eines Hornhechts" at Naples. The description of the species is limited to external characters, but the figure shows it to be closely related to, and possibly the same as, *Cyclobothrium charcoti*, which was described by Dollfus (1922a; 1922b) from a crustacean parasitic on the skin and in the mouth of *Trachurus trachurus* and *Box boops*. A comparison of the essential characters of these forms with those of the type and other species at present included in the genus *Choricotyle* Beneden and Hesse (1863) shows them to be sufficiently similar as to be regarded as congeneric.

As present constituted the genus *Cyclocotyla* contains the following species: *Cyclocotyla belones* Otto, 1823, from "Hornhecht," *C. charcoti* (Dollfus, 1922), n. comb., from *Cymothoa* (*Meinertia*) *oestroïdes* parasitic on *Trachurus trachurus* and *Box boops*; *C. chrysophryi* (Beneden and Hesse, 1863), n. comb., from *Chrysophrys aurata* and *Pagellus centrodontus*; *C. caulolatlili* (Meserve, 1938), n. comb., from *Caulolatilus princeps*; *C. elongata* (Goto, 1894), n. comb., from *Pagrus tumifrons*; *C. labracis* (Cerfontaine, 1895), n. comb., from *Labrax lupus*; *C. neomaenis* (MacCallum, 1917), n. comb., from *Lutianus analis*; *C. pagelli* (Gallien, 1937), n. comb., from *Pagellus centrodontus*; *C. prionoti* (MacCallum, 1917), n. comb., from *Merulinus carolinus*; *C. smarisi* (Ijima, in Goto, 1894),⁸ n. comb., from *Smaris vulgaris* (on caudal segment of a *Cymothoa*); *C. squillarum* (Parona and Perugia, 1889), n. comb., from *Bopyrus squillarum*; and *C. taschenbergii* (Parona and Perugia, 1889), n. comb., from *Sargus rondeletii*. Of these, only *C. neomaenis* and *C. prionoti* are known to occur on North American hosts.

***Cyclocotyla neomaenis* (MacCallum, 1917),**
n. comb.
Figs. 7-9

Synonyms.—*Diclidophora neomaenis* MacCallum, 1917; *Choricotyle neomaenis* (MacCallum, 1917) Llewellyn, 1941.

Description.—Body fusiform, 9 mm long, including haptor, by 1.1 mm wide. Anterior haptor in form of a pair of suckers, each 80 μ in diameter, opening into oral cavity. Posterior haptor 2.5 mm long, distinctly set off from body proper by an isthmuslike constriction, bearing four pairs of pedunculated clamplike suckers. Suckers of anterior three pairs about equal in size, 460 μ wide, and those of posterior pair much smaller, 320 μ wide; suckers of general type of other representatives of genus, but with heavy corrugations of surface of inner wall of outer quadrants, and with fleshy linguiform pad in depth of sucker cavity; cuticular supporting structure somewhat more complicated than that of other species (Fig. 8); no hooks observed between posterior pair of peduncles. Oral aperture subterminal; pharynx oval, 80 μ

⁸ The question of authorship of this species in this case parallels that of *Diclidophora merlangi*.

long by 64 μ wide; remainder of digestive tract not observable. Excretory apertures laterodorsal, slightly anterior to level of genital aperture; remainder of excretory system not observable. Genital aperture median, about 696 μ from anterior end of body. Cirrus 88 μ in diameter, armed with 12 inwardly projecting hooks. Testes relatively few, in median field posterior to ovary. Ovary preequatorial: oötype preovarian, massive, surrounded by numerous unicellular glands. Vitelline follicles numerous, occupying almost entire body width from level of genital aperture to posterior end of body proper, extending into haptor. Vagina and genitointestinal canal not observed. No eggs present.

Host.—*Lutianus analis* (Cuvier and Valenciennes).

Location.—Gills.

Distribution.—United States (Key West, Fla.).

Specimen.—U.S.N.M. Helm. Coll. no. 35587 (type).

This species was described from a single specimen collected by the late Dr. G. A. MacCallum at the New York Aquarium, from a muttonfish obtained from Key West, Fla. The species differs from all others of the genus in the peculiar structure of the haptoral suckers.

***Cyclocotyla prionoti* (MacCallum, 1917),**
n. comb.
Fig. 10

Synonyms.—*Diclidophora prionoti* MacCallum, 1917; *Choricotyle prionoti* (MacCallum, 1917) Llewellyn, 1941.

Description.—Body elongate, 3 to 3.7 mm long by 540 to 640 μ wide, anterior end with constriction between tip of body and genital aperture. Anterior haptor in form of a pair of suckers, about 88 μ in diameter, opening into oral cavity. Posterior haptor palmate, about 640 to 720 μ long, with four pairs of pedunculated suckers about 240 μ in diameter; peduncles of suckers relatively long and thick. Oral aperture subterminal; pharynx piriform, about 160 μ long by 88 μ wide; remainder of digestive system not ascertainable in available specimens. Genital aperture median, about 400 μ from anterior end of body. Cirrus 40 to 48 μ in diameter, armed with 10 inwardly curved hooks. Testes 21 to 32 in number, relatively

large, median, postovarial. Ovary tubular, folded, median, about one-third of body length from anterior end. Vitelline follicles relatively large, extending from slightly anterior to genital aperture to posterior end of haptor. Seminal receptacle oval, relatively large, posterior to ovary and to right of median line. Genitointestinal canal and vagina not observed. Oötype postovarial, surrounded by prominent mass of unicellular glands. No eggs in available specimens.

Host.—*Merulinus carolinus* (Linnaeus).

Location.—Gills.

Distribution.—United States (Woods Hole, Mass.).

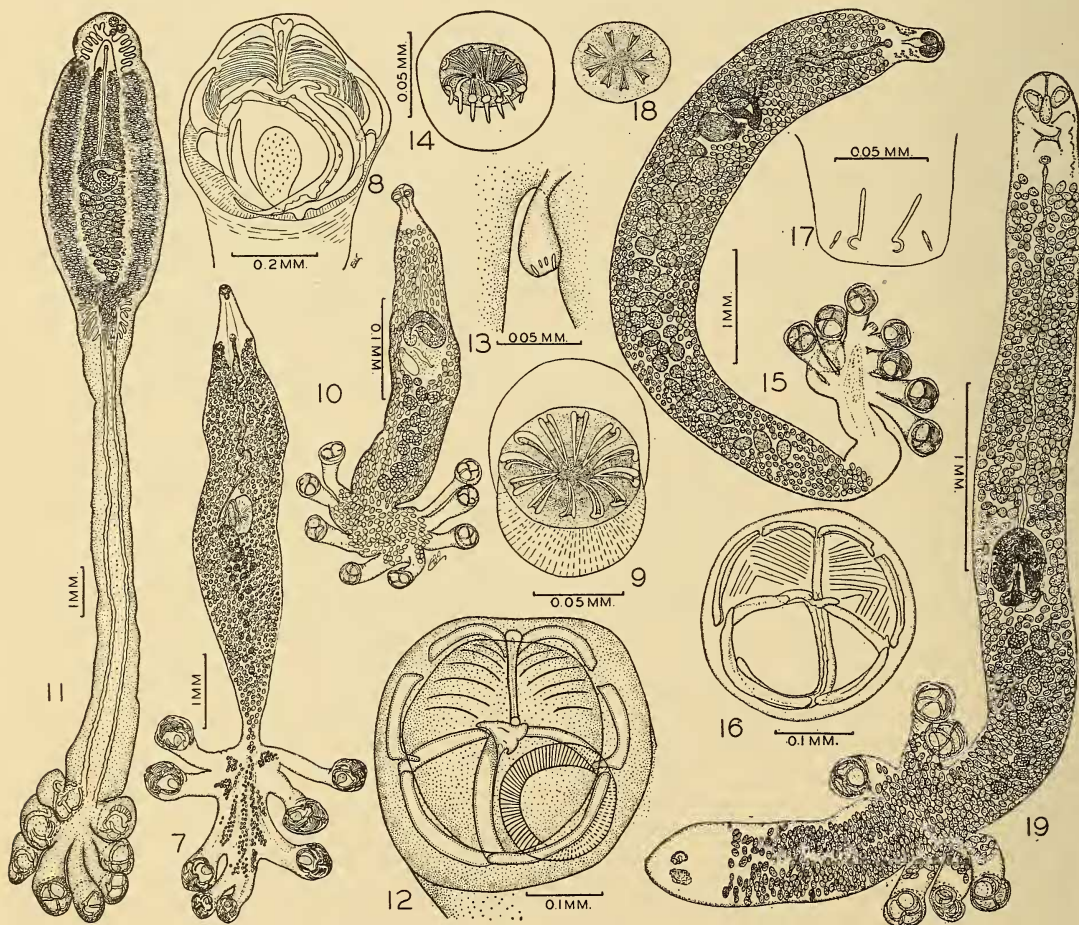
Specimens.—U.S.N.M. Helm. Coll. nos. 35589 (cotypes), 35590, and 35591.

This species is closely related to *Cyclocotyla chrysophryi* (Beneden and Hesse); it differs from that species, in so far as one can determine from the original description, in the number of genital hooks (8 in *C. chrysophryi* and 10 in *C. prionoti*). MacCallum (1917) stated that the number of genital hooks was 13, but this is an error.

Genus *Cyclobothrium* Cerfontaine, 1895

Synonym.—*Diclidophora* Diesing, of Goto, 1894, in part.

Diagnosis.—Haptor indistinctly set off from body proper; suckers sessile. Genital atrium nonmuscular; cirrus armed. Testes numerous, preovarial and postovarial. Vaginae absent.



Figs. 7-9.—*Cyclocotyla neomaenis*: 7, Complete worm, ventral view; 8, haptoral sucker; 9, cirrus. Fig. 10.—*Cyclocotyla prionoti*, complete worm, ventral view. Figs. 11-14.—*Neoheterobothrium affine*: 11, Complete worm, dorsal view; 12, haptoral sucker; 13, haptoral languette; 14, cirrus. Figs. 15-18.—*Neoheterobothrium cynoscioni*: 15, Complete worm, ventral view; 16, haptoral sucker; 17, haptoral languette; 18, cirrus. Fig. 19.—*Pedocotyle morone*, complete worm, dorsal view.

Type species.—*Cyclobothrium sessilis* (Goto, 1894) Cerfontaine, 1895.

This genus comprises *Cyclobothrium iniistii* Yamaguti (1937), from *Iniistius dea*; *C. semicossyphi* Yamaguti (1938), from *Semicossyphus reticulatus*; and *C. sessilis* (Goto, 1894), from *Choerops japonicus* and *Semicossyphus reticulatus*; all three species are from Japanese hosts.

Genus **Heterobothrium** Cerfontaine, 1895

Synonym.—*Diclidophora* Diesing, of Goto, 1894, in part.

Diagnosis.—Haptor separated from body proper by a long slender isthmus: suckers sessile, framework of anterior pair orientated inversely with respect to that of posterior three pairs. Genital atrium nonmuscular, cirrus armed; testes postovarial. Vaginae absent; vitellaria not extending into haptor.

Type species.—*Heterobothrium tetrodonis* (Goto, 1894) Cerfontaine, 1895.

The type and only species of this genus was obtained from the gills of *Tetrodon* sp. in Japan; it is not known to occur on North American hosts.

Neoheterobothrium, n. gen.

Diagnosis.—Haptor separated from body proper by a long slender isthmus; suckers pedunculated, with framework of all pairs orientated in same manner. Other characters as in *Heterobothrium*.

Type species.—*Neoheterobothrium affine* (Linton, 1898), n. comb.

The species referable to this genus are *Neoheterobothrium affine* (Linton, 1898) from *Paralichthys dentatus* and *N. cynoscioni* (MacCallum, 1917), n. comb., from *Cynoscion regalis*, both from North America; and possibly *Octobothrium leptogaster* (F. S. Leuckart, 1830) (= *N. leptogaster* (F. S. Leuckart, 1830), n. comb.) from *Chimaera monstrosa* in Europe.

Neoheterobothrium affine (Linton, 1898),
n. comb.

Figs. 11–14

Synonyms—*Octoplectanum affine* Linton, 1898; *Diclidophora affinis* (Linton, 1898) Linton, 1901; *Choricotyle affine* (Linton, 1898) Llewellyn, 1941.

Description.—Body elongate, 11 to 20 mm long by 2 to 3 mm wide, divided into three parts, namely, body proper, isthmus and hap-

tor. Anterior haptor consisting of a pair of suckers 120 to 170 μ in diameter, opening into oral cavity. Posterior haptor 2 to 3 mm. in diameter, consisting of 8 digitate appendages bearing suckers 425 to 510 μ in diameter supported by a heavily cuticularized framework as shown in Fig. 12. Between peduncles of posterior pair of suckers is a small projection or "languette," about 50 μ long by 25 μ wide, apparently bearing two pairs of hooks (hooks missing but insertions clearly visible). Oral aperture subterminal; pharynx piriform, 170 to 180 μ long by 110 to 170 μ wide; intestinal branches with prominent lateral diverticula as far back as isthmus, then without diverticula, extending into haptor. Genital aperture median, about 510 to 680 μ from anterior end of body; cirrus armed with a circle of incurved hooks, 12 to 16 in number, each about 20 μ long. Testes numerous, number not ascertainable, postovarial, in median field. Ovary folded, median, approximately in equatorial region of preisthmian portion of body. Vitelline follicles extending from a short distance posterior to level of genital aperture to distal part of preisthmian portion of body. Seminal receptacle and genitointestinal canal not observed. Egg about 150 μ long by 57 μ wide, with prolongation at each pole.

Host.—*Paralichthys dentatus* (Linnaeus) and *P. lethostigmus* Jordan and Gilbert.

Location.—Mouth.

Distribution.—United States (Woods Hole, Mass., and Grand Island Region, La.).

Specimens.—U.S.N.M. Helm. Coll. nos. 4876 (type), 4875, and 8156.

The redescription of this species as given here is based on toto mounts of the type and other specimens described from Woods Hole, Mass., by Linton (1898; 1901; 1940). The preparations were not very good and some details could not be made out. Melugin (1940) has reported this species from Louisiana.

Neoheterobothrium affine resembles *Octobothrium leptogaster* (F. S. Leuckart) [= *Neoheterobothrium leptogaster* (F. S. Leuckart)] as described by Olsson (1876) and by Parona and Perugia (1892) in possessing a long, slender isthmus between body proper and haptor. The two species are also similar in that both possess a hook-bearing lobe or "languette" between the peduncles of the posterior pair of haptoral

suckers (see Ruszkowski, 1934, for description of the hooks of *O. leptogaster*). The presence of a "languette" in these species may not be of especial significance, however, as many of the members of the family Diclidophoridae possess this structure. In spite of obvious similarities there is little likelihood of the two species being identical because of their host affinities, there being an extraordinary host specificity among the Monogenea.

Neoheterobothrium cynoscioni

(MacCallum, 1917), n. comb.

Figs. 15-18

Synonyms.—*Diclidophora cynoscioni* MacCallum, 1917; *Choricotyle cynoscioni* (MacCallum, 1917) Llewellyn, 1941.

Description.—Body elongate, 7 to 10 mm long by 400 to 616 μ wide, attenuated posteriorly. Anterior haptor in form of a pair of suckers 120 μ in diameter opening into oral cavity. Posterior haptor somewhat palmate, about 640 μ long, with four pairs of pedunculated suckers, and with small, flaplike lobe bearing two pairs of hooks between peduncles of last pair of suckers; suckers about 288 μ in diameter, with heavily cuticularized framework as shown in Fig. 16; posterior lobe 120 μ long by 72 μ wide, outer hooks 12 μ long and inner hooks 28 to 30 μ long. Oral aperture subterminal; pharynx piriform, 120 μ long by 80 μ wide; esophagus and intestinal branches not traceable in available specimens. Genital aperture median, about 430 to 460 μ from anterior end of body. Cirrus 48 to 50 μ in diameter, armed with eight hooks. Testes 28 to 30 in number, relatively large, occupying median field posterior to ovary. Ovary tubular, folded, median, about one-third of body length from anterior end. Vitelline follicles extending from level of genital aperture to about midway between level of last testis and anterior margin of haptor. Seminal receptacle oval, relatively voluminous, posterior to ovary and slightly to right of median line. Genitointestinal canal and vagina not observable. No eggs present.

Host.—*Cynoscion regalis* (Bloch and Schneider).

Location.—Gills.

Distribution.—United States (Woods Hole, Mass.).

Specimens.—U.S.N.M. Helm. Coll. nos. 35592 (type) and 35593.

The type specimen of this species is greatly elongated and somewhat mutilated; it was collected by the late Dr. G. A. MacCallum August 26, 1914. Three additional specimens are available, collected by MacCallum July 2, 1924; these are in much better condition than the type, and the greater part of the above description is based upon these specimens. In the type specimen the small lobe or "languette" at the posterior end of the haptor was folded over one of the peduncles and was not observed by MacCallum.

***Cyclocotyloides*, n. gen.**

Diagnosis.—Haptoral suckers pedunculated. Genital atrium strongly muscular; cirrus unarmed; otherwise similar to *Cyclocotyloides*.

Type species.—*Cyclocotyloides pinguis* (Linton, 1940), n. comb.

Only one species, the type, is referable to this genus. *C. pinguis* was described by Linton (1940) as *Diclidophora pinguis* and was based on specimens from the mouth of *Albatrossia pectoralis*. The specimens available to the writer were fragmentary and nothing can be added to the original description. The absence of clamp-like haptoral suckers excludes this species from the genus *Diclidophora* and the presence of a muscular genital atrium and the absence of an armed cirrus exclude it from other genera of the Cyclocotylinae.

Genus *Diclidophoropsis* Gallien, 1937

Diagnosis.—Haptoral suckers pedunculated. Genital atrium nonmuscular; cirrus armed; testes postovarial. Vaginae present; vitellaria extending into haptor.

Type species.—*Diclidophoropsis tissieri* Gallien, 1937.

The type and only species was described by Gallien (1937) from specimens collected on *Macrurus laevis* in the Atlantic Ocean south of Ireland.

Genus *Pedocotyle* MacCallum, 1913

Synonym.—*Podocotyle* MacCallum, 1913, not Dujardin, 1845.

Diagnosis.—Haptor linguiform, not distinct from body proper, bearing three pairs of pedunculated suckers at anterior end of haptor and one pair of smaller sessile suckers near posterior end. Testes postovarial. Vitellaria extending into haptor.

Type species.—*Pedocotyle morone* MacCallum, 1913.

Pedocotyle morone MacCallum, 1913

Fig. 19

Synonym.—*Podocotyle morone* MacCallum, 1913.

Description.—Body slender, 5.9 mm long by 500 μ wide, apparently flat and ribbonlike, sides parallel. Anterior haptor in form of two suckers, 115 μ in diameter, opening into mouth cavity. Posterior haptor linguiform, not distinguishable from body proper, with 3 pairs of pedunculated suckers at its anterior end and one pair of smaller sessile suckers near posterior end. Anterior pedunculated suckers 228 μ in diameter, with heavily cuticularized supporting structure similar to that in *Neoheterobothrium cynoscioni* (see Fig. 16); peduncles about 228 μ long by 180 μ in diameter; suckers of posterior pair about 76 μ in diameter, apparently of the same structure as those of anterior pairs (crushed in type specimen). Mouth terminal; pharynx piriform, 150 μ long by 83 μ wide; esophagus and intestine not discernible in available specimen. Genital aperture median, about 375 μ from anterior end of body. Cirrus muscular, 57 μ in diameter, armed with 10 inwardly curved hooks. Testes 14 in number, about 115 μ in diameter, in median field between ovary and anterior end of haptor. Ovary tubular, folded, median. Vitelline follicles occupying greater part of body from level of genital aperture to near posterior end of haptor. Seminal receptacle small, posterior to ovary and to right of median line. Genitointestinal canal and vagina not observed. Oötype prominent, surrounded by numerous unicellular glands. No eggs in available specimen.

Host.—*Morone americana* (Gmelin).

Location.—Gills.

Distribution.—United States (New York).

Specimen.—U.S.N.M. Helm. Coll. no. 35594 (type).

This species, based on a single specimen and originally described by MacCallum (1913a; 1913b), is peculiar in the arrangement of the suckers of the posterior haptor; because of its unique appearance, further comment as to its differentiation from related forms is unnecessary.

DICLIDOPHORIDAE OF UNCERTAIN POSITION

Genus *Platycotyle* Beneden and Hesse, 1863

Diagnosis.—Haptor rectangular, bearing four widely separated pedunculated suckers; terminal hooks absent.

Type species.—*Platycotyle gurnardi* Beneden and Hesse, 1863.

The type and only species of the genus is known only from the very inadequate description given by Beneden and Hesse (1863); this worm was collected from the gills of *Trigla gurnardus* in Europe.

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ZOOLOGY.—*Notes on Mexican urocoptid mollusks*.¹ PAUL BARTSCH, U. S. National Museum.

The preparation of a monograph on the Cuban land mollusks of the family Urocoptidae by Dr. Carlos de la Torre and myself has made it necessary to subject the entire family to a critical overhauling. This has brought to light considerable misunderstanding on the part of the older authors,

due largely to the fact that at the time when they were working little was known of the anatomy and structure of the columella, the lamellation of the interior shell, and even less of the circumscribed ecologic conditions under which these animals exist. Today some of the deficiencies have been met, more or less, and the mass of material available for study furnishes a clearer viewpoint, and the results of the revisional work show a

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